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ABSTRACT

This study was designed to ascertain the relationships between the steps of a tool designed to link knowledge production and the needs of knowledge users (the Wolf-Welsh Linkage Methodology or WWLM) with milestones in the evolution of an innovative computer-assisted instructional system called PLATO (Programming Logic for Advanced Teaching Operations), and to explore the viability of the components of the WWLM in the light of the data obtained. The seven steps of the WWLM provided a context within which an ex post facto analysis of specific aspects of PLATO's evolution took place. Data were gathered in varying ways, including a search of the ERIC database, contacts with officials within public and private funding agencies associated with PLATO, visits with University of Illinois researchers associated with PLATO, and extensive communication with officials of Control Data Corporation, the marketer of the system. Relationships between all seven steps of the WWLM and milestones in the evolution of PLATO were found, especially during the demonstration/implementation period of 1972-76. Although the calibre and depth of the contact varied considerably across steps, none of the steps of the WWLM was by-passed, and no major gaps in the methodology were apparent as an outcome of the study. It was concluded that: (1) PLATO's evolution was successful, though not to the degree expected by most of the developers; (2) the WWLM confirmed overall decisions made and also focused upon the strengths and shortcomings of specific development decisions; and (3) the inclusion of seven steps within the WWLM methodology was confirmed by this analysis of PLATO's evolution. (EW)

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The PLATO System: A Study In the Diffusion of An Innovation

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Objectives

The purpose of the study was to ascertain relationships between steps of a tool designed to link knowledge production and needs of knowledge users (the Wolf-Welsh Linkage Methodology), and milestones in the evolution of an innovative computer-assisted instructional system called PLATO (Programming Logic for Advanced Teaching Operations). Specific aspects of the study involved the following:

-To ascertain milestones in the evolution of the PLATO system which are believed to account for the system's widespread utilization.

-To relate milestones discerned to specific components of the Wolf-Welsh Linkage Methodology in order to determine similarities, differences, and gaps of interest.

-To pass judgement on the viability of the components of the Wolf-Welsh Linkage Methodology in light of data obtained.

Perspectives

Researchers have learned much about relationships between (a) the process of innovation adoption, (b) attributes of innovations, and (c) adopter characteristics on the one hand and the rate of adoption of innovations on the other hand (Miles, 1964; Rogers, 1984). Unfortunately, what has been learned about these kinds of relationships has not been translated into convenient forms apt to be used by persons who overtly or covertly address linkage tasks as part of their work. Most of these persons (i.e. linkage agents) don't have the time available to seek out and then integrate outcomes of research meaningfully; they do not command technical skills required to interpret outcomes of related research; and, they are not able to transform research results into forms apt to be incorporated within personal practice. Hence, research outcomes fail--all too often--to impact meaningfully upon knowledge diffusion and knowledge utilization practices within organizations meaningfully.

While "convenient forms" may not exist, there are resources evolving which aspire to link knowledge production and needs of knowledge users within organizations. Some of these resources may help linkage agents navigate judiciously between the twin terrors of their practice--that is, change for the sake of change (Scylla) and institutional rigor mortis (Charybdis). One of these tools, the Wolf-Welsh Linkage Methodology (WWLM), was a focal point of this study.

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Utilization of and validation of the WWLM has proven to be a most complex challenge. The challenge involves: (a) training persons to be able to implement the instrument; (b) locating an organizational context about to embark upon a change venture; (c) obtaining resources to facilitate work envisioned, and (d) evaluating both the instrument's implementation as well as consequences of the change initiative. Two problems have thwarted the developer's efforts for the past several years: first, getting linkage agents to try out and/or make use of the tool; and second, getting linkage agents to address the evaluation step of the methodology systematically.

Application of the two tools in an ex post facto manner has proven to be a productive exception to this woe. Amburgy (1983) and Radlo (1978) pioneered such an application with considerable success. Both conceived a study within which the WWLM was used to make sense of data drawn from the archives of state and federal agencies. Study outcomes exceeded expectations. Amburgy's and Radlo's inquiry mode helped frame this study.

The PLATO system was selected for analysis because of three realities:

1. PLATO's evolution has been well-documented; hence, a people and paper trail exists.
2. Both people and paper were accessible.
3. PLATO has been adopted or adapted by scores of institutions (including institutions of higher education, corporations, the military, etc.).

Resources accumulated over more than twenty years of development, diffusion, and implementation, were available to the researchers.

Research Context

The WWLM's seven steps provided the context within which an ex post facto analysis of specific aspects of PLATO's evolution transpired. A brief synopsis of the methodology, the PLATO system, and the acquisition of data is offered to clarify key elements of the study.

The WWLM. The current version of the WWLM (six revisions) is akin to a road map that specifies a starting point, alternative routes, and a destination. It adds order and direction to the knowledge diffusion and knowledge utilization processes within organizations not accustomed to either order or direction.

The WWLM consists of seven distinct but inter-related parts. Each part is made up of two components: The first is a brief orientation statement intended to clarify the nature of information sought; the second is a set of recommendations aimed at acquiring needed information. Whereas the seven parts are presented sequentially, their inter-related nature calls for application of specific parts in conjunction with opportunities presented. These parts prescribe a relevant frame of reference within which individual ingenuity is encouraged and is able to flourish.

PLATO. PLATO was conceived as a computerized tutorial with feedback by University of Illinois researchers. It evolved into a complex product which included an operating system, an authoring language, and hardware (marketed by Control Data Corporation). Developmental costs of the system are in the vicinity of one billion dollars.

PLATO is used extensively at the present time. Control Data Corporation's training institutes draw heavily upon PLATO; more than 75 systems operate across the nation (50 within industry) which are linked to

over 200 institutions of higher education; and recent PLATO software advances now reach into microcomputer applications.

Data Acquisition. PLATO evolved in three somewhat distinct stages: development (1960-1972); demonstration/implementation (1972-1976); and refinement/expansion (1976-present). Whereas data were gathered across all three stages, the demonstration and implementation period proved to be of primary interest to the researchers.

Data were acquired in varying ways. That is: key selector terms were identified and applied within information repositories (i.e. ERIC) to locate information; officials within public and private funding agencies who were identified with PLATO were contacted and followed up with visits; University of Illinois researchers associated with PLATO were visited; and extensive communication was exchanged with Control Data Corporation officials. These sources yielded an immense array of information which was ordered within the context of the seven steps of the WWLM. Researchers then proceeded to examine patterns within these data to ascertain relationships between milestones in PLATO's evolution and the structure of the WWLM.

Implications

Relationships between steps of the WWLM and milestones in the evolution of PLATO were discerned. All seven steps of the methodology were touched by the PLATO developers, especially during the demonstration/implementation period of 1972-76. However, the calibre and depth of the contact varied considerably across steps. Most importantly, none of the steps of the WWLM was by-passed, and no major gaps in the methodology were apparent as an outcome of the study.

The ex post fact analyses yielded some welcome but unexpected dividends. Aggressive actions taken by the developers during the 1960-72 period to establish firmly the conceptual foundations and practical applications of the innovation reinforced the importance of several initial steps of the WWLM. Also, the WWLM identified roots of several problems which frustrated PLATO project members throughout the demonstration/implementation period (and beyond).

The bottom line? A most complex innovation was developed, demonstrated, implemented, and sustained to the present time. PLATO's evolution was successful, but not to the degree most developers expected. The WWLM confirmed overall decisions made and also focused upon strengths and shortcomings of specific development decisions. In turn, inclusion of seven steps within the methodology was confirmed by the analysis of PLATO's evolution.